BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XG132

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the South Basin Improvements Project at the San Francisco Ferry Terminal

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received a request from the San Francisco Bay Area Water Emergency Transportation Authority (WETA) for authorization to take marine mammals incidental to Downtown San Francisco Ferry Terminal Expansion Project, South Basin Improvements Project in San Francisco, California. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [*INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Fowler@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Amy Fowler, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

NMFS has defined "negligible impact" in 50 CFR 216.103 as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

The MMPA states that the term "take" means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal.

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (incidental harassment authorizations with no anticipated serious injury or mortality) of the

Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On January 22, 2018, NMFS received a request from WETA for an IHA to take marine mammals incidental to expansion and improvements at the downtown San Francisco ferry terminal. The application was determined to be adequate and complete on April 10, 2018. WETA's request is for take of seven species of marine mammals by Level B harassment only. This authorization would be valid from June 1, 2018 to May 31, 2019. Neither WETA nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued an IHA to WETA for similar work (82 FR 29521, June 29, 2017). WETA complied with all the requirements (*e.g.*, mitigation, monitoring, and reporting) of the previous IHA and information regarding their monitoring results may be found in the "Estimated Take" section.

Description of Proposed Activity

Overview

WETA is proposing to expand berthing capacity at the Downtown San Francisco Ferry Terminal, located at the San Francisco Ferry Building, to support existing and future planned water transit services operated on San Francisco Bay by WETA and WETA's emergency operations.

The Downtown San Francisco Ferry Terminal Expansion Project would eventually include phased construction of three new water transit gates and overwater berthing facilities, in addition to supportive landside improvements, such as additional passenger waiting and queueing areas, circulation improvements, and other water transit-related amenities. The new gates and other improvements would be designed to accommodate future planned water transit services between Downtown San Francisco and Antioch, Berkeley, Martinez, Hercules, Redwood City, Richmond, and Treasure Island, as well as emergency operation needs. According to current planning and operating assumptions, WETA will not require all three new gates (Gates A, F, and G) to support existing and new services immediately. As a result, WETA is planning that project construction will be phased. The first phase will include construction of Gates F and G, as well as other related improvements in the South Basin.

Dates and Duration

In-water construction activities (*i.e.*, pile driving) will be scheduled to be completed during the authorized work window for construction in San Francisco Bay established by the Long-Term Management Strategy. In the project area, the authorized in-water work window is June 1 through November 30. WETA estimates the project may take up to 41 days of activity within the in-water work window. This proposed authorization would be valid from June 1, 2018 through May 31, 2019.

Specific Geographic Region

The San Francisco ferry terminal is located in the western shore of San Francisco Bay (see Figure 1 of WETA's application). The ferry terminal is five blocks north of the San

Francisco-Oakland Bay Bridge (Bay Bridge). More specifically, the South Basin of the terminal is located between Pier 14 and the ferry plaza. San Francisco Bay and the adjacent Sacramento-San Joaquin Delta make up one of the largest estuarine systems on the continent. The Bay has undergone extensive industrialization, but remains an important environment for healthy marine mammal populations year round. The area surrounding the proposed activity is an intertidal landscape with heavy industrial use and boat traffic.

Detailed Description of Specific Activity

The project supports existing and future planned water transit services operated by WETA and regional policies to encourage transit uses. Furthermore, the project addresses deficiencies in the transportation network that impede water transit operation, passenger access, and passenger circulation at the Ferry Terminal.

The project will accommodate the existing and future planned water transit service outlined in WETA's Implementation and Operations Plan for the San Francisco Bay Area. The addition of two new gates will accommodate an expansion of WETA services from 5,100 to 19,160 passengers per weekday by the year 2035; and an increase in peak-period WETA vessel arrivals from 14 to approximately 30. In addition to regularly scheduled ferry transit, facility improvements would allow for increased capacity for emergency use. With the improvements in place, WETA will have the capacity to evacuate approximately 7,200 passengers per hour from its four gates.

The new gates (Gates F and G) will be built similarly. Each gate will be designed with an entrance portal—a prominent doorway providing passenger information and physically separating the berthing structures from the surrounding area. The entrance portal will also contain doors, which can be secured.

Berthing structures will be provided for each new gate, consisting of floats, gangways, and guide piles. Figure 3 of WETA's application depicts a simulated view of the proposed berthing structures. The steel floats will be approximately 42 feet (ft) wide by 135 ft long. The steel truss gangways will be approximately 14 ft wide and 105 ft long. The gangway will be designed to rise and fall with tidal variations while meeting Americans with Disabilities Act (ADA) requirements. The gangway and the float will be designed with canopies, consistent with the current design of Gates B and E. The berthing structures will be fabricated offsite and floated to the project area by barge.

Six steel guide piles will be required to secure each float in place. In addition, dolphin piles may be used at each berthing structure to protect against the collision of vessels with other structures or vessels. A total of up to 14 dolphin piles may be installed, consisting of ten new dolphin piles and four relocated dolphin piles.

Chock-block fendering will be added along the East Bayside Promenade, to adjacent structures to prevent collision. The chock-block fendering will consist of square, 12-inch-wide, polyurethane-coated, pressure-treated wood blocks that are connected along the side of the adjacent pier structure, and supported by polyurethane-coated, pressure-treated wood piles.

In addition, the existing Gate E float will be moved 43 ft to the east, to align with the new gates and the East Bayside Promenade. The existing six 36-inch (in) diameter steel guide piles will be removed using vibratory extraction, and reinstalled to secure the Gate E float in place. Because of Gate E's new location, to meet ADA requirements, the existing 90 ft steel truss gangway will be replaced with a longer, 105 ft gangway.

Table 1. Summary of Pile Installation.

Project Element	Pile Diameter	Pile Length	Number of Piles	Schedule
Embarcadero Plaza, East Bayside Promenade, and Interim Access Structure	30 in	135 to 155 ft	18	Up to 9 days
Embarcadero Plaza, East Bayside Promenade, and Interim Access Structure	24 in	135 to 155 ft	30	Up to 15 days
Gates E, F, and G Dolphin Piles	36 in	145 to 155 ft	10 (two at each of the floats for protection, two between each of the floats)	Up to 5 days
Gate F and G Guide Piles	36 in	140 to 150 ft	12 (six per gate)	Up to 6 days
Gate E Guide Piles	36 in	145 to 155 ft	6	Up to 3 days
Barrier Piles near Pier 14	24 in	135 to 155 ft	5	Up to 3 days
		Total	81 piles	41 days

Construction of the project improvements requires pile driving. Pile driving for the project includes impact or vibratory pile driving associated with construction of the berthing structures, the Embarcadero Plaza, and East Bayside Promenade. Much of the pile driving associated with the project was completed in 2017 and was covered under a previous IHA. All pile driving completed in 2017 was vibratory; no impact pile driving was conducted. The pile sizes and numbers that will be driven in 2018 are detailed in Table 1. Pile driving will occur during daylight hours only and one hammer will be used at a time. Vibratory driving may install up to four piles per day and impact driving may install up to three piles per day but a conservative estimate of two piles per day is used to estimate the duration of the project. Vibratory driving of 24-in and 30-in piles may take up to 15 minutes per pile while vibratory driving of 36-in piles may take up to 20 minutes per pile. Piles driven with an impact hammer will require an estimated 1800 strikes per pile, regardless of pile size. Underwater sound and acoustic pressure resulting from pile driving could affect marine mammals by causing behavioral avoidance of the construction area, and/or injury to sensitive species.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see "Proposed Mitigation" and "Proposed Monitoring and Reporting").

Description of Marine Mammals in the Area of Specified Activities

Sections 4 and 5 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SAR; *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*www.fisheries.noaa.gov/find-species*).

Table 2 lists all species with expected potential for occurrence near downtown San Francisco and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2016). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's U.S. 2016 SARs (Caretta *et al.*, 2017). All values presented in Table 2 are the most recent available at the time of publication and are available in the 2016 SARs (Caretta *et al.*, 2017).

Table 2. Marine Mammals in the Vicinity of Downtown San Francisco.

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, Nmin, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Eschrichtiidae						
Gray whale	*Eschrichtius robustus*	Eastern North Pacific	-/- ; N	20,990 (0.05, 20,125, 2011)	624	132
Family Balaenopteridae (rorquals)						
Humpback whale	*Megaptera novaeangliae*	California/Oregon/Washington	E/D ; Y	1,918 (0.03, 1,876, 2014)	11	> 6.5
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Bottlenose dolphin	*Tursiops truncatus*	California Coastal	-/- ; N	453 (0.06, 346, 2011)	2.7	> 2
Family Phocoenidae (porpoises)						
Harbor porpoise	*Phocoena phocoena*	San Francisco-Russian River	-/- ; N	9,886 (0.51, 6,625, 2011)	66	0
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California sea lion	*Zalophus californianus*	U.S.	-/- ; N	296,750 (n/a, 153,337, 2011)	9,200	389
Northern fur seal	*Callorhinus ursinus*	California	-/- ; N	14,050 (n/a, 7,524, 2013)	451	1.8
Guadalupe fur seal	*Arctocephalus townsendi*	Mexico to California	T/D ; Y	20,000 (n/a, 15,830, 2010)	542	> 3.2
Family Phocidae (earless seals)						

Pacific harbor seal	*Phoca vitulina richardii*	California	-/- ; N	30,968 (n/a, 27,348, 2012)	1,641	43
Northern elephant seal	*Mirounga angustirostris*	California Breeding	-/- ; N	179,000 (n/a, 81,368, 2010)	4,882	8.8

[1] Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
[2] NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable
[3] These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.
NOTE - Italicized species are not expected to be taken or proposed for authorization

All species that could potentially occur in the proposed survey areas are included in Table 2. However, the temporal and/or spatial occurrence of humpback whales and Guadalupe fur seals is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. Humpback whales are rare visitors to the interior of San Francisco Bay. A recent, seasonal influx of humpback whales inside San Francisco Bay near the Golden Gate was recorded from April to November in 2016 and 2017 (Keener 2017). The Golden Gate is outside of this project's action area and humpback whales are not expected to be present during the project. Guadalupe fur seals occasionally range into the waters of Northern California and the Pacific Northwest. The Farallon Islands (off central California) and Channel Islands (off southern California) are used as haulouts during these movements (Simon 2016). Juvenile Guadalupe fur seals occasionally strand in the vicinity of San Francisco, especially during El Niño events. Most strandings along the California coast are animals younger than two years old, with evidence of malnutrition (NMFS 2017c). In the rare event that a Guadalupe fur seal is detected within the Level A or Level B harassment zones, work will cease until the animal has left the area (see "Proposed Mitigation").

Gray Whale

Gray whales are large baleen whales. They grow to approximately 50 ft in length and weigh up to 40 tons. They are one of the most frequently seen whales along the California coast, easily recognized by their mottled gray color and lack of dorsal fin. Adult whales carry heavy loads of attached barnacles, which add to their mottled appearance. Gray whales are divided into the Eastern North Pacific and Western North Pacific stocks. Both stocks migrate each year along the west coast of continental North America and Alaska. The Eastern North Pacific stock is much larger and is more likely to occur in the San Francisco Bay area. With the exception of an unusual mortality event in 1999 and 2000, the population of Eastern North Pacific stock has increased over the last 20 years and has been stable since the 1990s (NMFS 2015c).

Gray whales are the only baleen whale known to feed on the sea floor, where they scoop up bottom sediments to filter out benthic crustaceans, mollusks, and worms (NMFS 2015c). They feed in northern waters primarily off the Bering, Chukchi, and western Beaufort Seas during the summer. Between December and January, late-stage pregnant females, adult males, and immature females and males migrate southward to breeding areas around Mexico. The northward migration occurs between February and March. Coastal waters just outside San Francisco Bay are considered a migratory Biological Important Area for the northward progression of gray whales (Calambokidis *et al.*, 2015). During this time, recently pregnant females, adult males, immature females, and females with calves move north to the feeding grounds (Calambokidis *et al.*, 2014). A few individuals enter into the San Francisco Bay during their northward migration. Some gray whales summer along the west coast of North America to forage and are additionally defined as the Pacific Coast Feeding Group. This group is separately monitored between June 1 and November 1 between northern California and northern British

Columbia by the International Whaling Commission (IWC 2012; Calambokidis *et al.*, 2015). The Pacific Coast Feeding Group has increased in abundance estimates since the 1990s and has been stable since 2003 (Calambokidis *et al.*, 2014).

Bottlenose Dolphin

Since the 1982-83 El Niño, which increased water temperatures off California, bottlenose dolphins have been consistently sighted along the central California coast (NMFS 2017b). The northern limit of their regular range is currently the Pacific coast off San Francisco and Marin Country and they occasionally enter San Francisco Bay, sometimes foraging for fish in Fort Point Cove, just inside the Golden Gate Bridge. The California Coastal Stock is frequently seen in nearshore waters (NMFS 2017b). Members of the California Coastal stock are transient and make movements up and down the coast into some estuaries, throughout the year.

Harbor Porpoise

Harbor porpoises generally occur in groups of two to five individuals and are considered to be shy, relatively nonsocial animals. The harbor porpoise has a small body, with a short beak and medium-sized dorsal fin. They can grow to approximately 5 ft and 170 pounds. Distribution of harbor porpoises is discontinuous due to a habitat preference of continental shelf waters. Harbor porpoises are typically found in waters less than 250 ft deep along the coast and in bays, estuaries, and harbors. Their prey consists of demersal and benthic species, such as schooling fish and cephalopods (NMFS 2014).

California Sea Lion

California sea lions are sexually dimorphic eared seals (family *Otariidae*). Males can reach up to 8 ft long and weigh 700 pounds whereas females are smaller, approximately 6 ft long and 200 pounds. California sea lions breed in southern California and along the Channel Islands during the spring. Although most females remain in southern California waters year-round, males and some subadult females range widely and occupy protected embayments like San Francisco Bay throughout the year (Caltrans 2012). Pupping does not occur in San Francisco Bay. They are extremely intelligent and social, and spend much of their time aggregated at communal haulouts. Group hunting is common and they may cooperate with other species, such as dolphins, when hunting large schools of fish. California sea lions feed on a variety of fish and squid species (NMFS 2015b).

During El Niño events, there is an increase in pup and juvenile mortality, which in turn affects future age and sex classes. Additionally, because there are fewer females present in the population after such events, pup production is further limited. Declines in pup production observed in 2000 and 2003 can be attributed in part to previous El Niño events, which affected the number of reproductive females in the population, and in part to domoic poisoning and an infestation of hook worms, which caused an increase in pup mortality (NMFS 2017a). There was an unusual mortality event declared in 2013 due to a high number of strandings with reasons unknown, but hypothesized to be associated with low forage fish availability close to pupping areas (NMFS 2015b). Despite intermittent years of increased pup mortality, statistical analyses of pup counts between 1975 and 2011 determined an approximate 5.4 percent annual increase between 1975 and 2008 (NMFS 2017a).

Although there is little information regarding the foraging behavior of the California sea lion in the San Francisco Bay, they have been observed foraging on a regular basis in the shipping channel south of Yerba Buena Island. Foraging grounds have also been identified for pinnipeds, including sea lions, between Yerba Buena Island and Treasure Island, as well as off the Tiburon Peninsula (Caltrans 2001). California sea lions in the San Francisco Bay may be feeding on Pacific herring (*Clupea harengus pallasii*), northern anchovy (*Engraulis mordax*), or other prey species (Caltrans 2013).

Northern Fur Seal

The range of the northern fur seal extends from southern California, north to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan (NMFS 2015e). There are two stocks of northern fur seal, the California stock and the Eastern Pacific stock. The Eastern Pacific stock is listed as strategic and depleted under the MMPA but the California stock is not (NMFS 2015e). Both the Eastern Pacific and California stocks forage in offshore waters outside San Francisco Bay. During the breeding season, the majority of the worldwide population is found on the Pribilof Islands in the Southern Bering Sea, with the remaining animals spread throughout the North Pacific Ocean. On the coast of California, small breeding colonies are present at San Miguel Island off southern California and the Farallon Islands off central California (NMFS 2015e). Northern fur seals are a pelagic species and are rarely seen near the shore away from breeding areas.

Harbor Seal

The Pacific harbor seal is one of five subspecies of *Phoca vitulina*, or the common harbor seal. They are a true seal, with a rounded head and visible ear canal. Males and females are similar in size and can exceed 6 ft and 300 pounds. Harbor seals generally do not migrate annually. They display year-round site fidelity, although they have been known to swim several hundred miles to find food or suitable breeding habitat.

Harbor seals have the broadest range of any pinniped, inhabiting both the Atlantic and Pacific oceans. In the Pacific, they are found in nearshore coastal and estuarine habitats form Baja California to Alaska, and from Russia to Japan. Of the three recognized populations of harbor seals along the west coast of the continental U.S., the California stock occurs in California coastal waters.

Harbor seals forage in shallow waters on a variety of fish and crustaceans that are present throughout San Francisco Bay, and therefore could occasionally be found foraging in the action area. They are opportunistic, general foragers (Gibble 2011). In San Francisco Bay, harbor seals forage in shallow, intertidal waters on a variety of fish, crustaceans, and a few cephalopods. The most numerous prey items identified in harbor seal fecal samples from haulouts in San Francisco Bay include yellow fin goby (*Acanthogobius flavimanus*), northern anchovy, Pacific herring, staghorn sculpin (*Leptocottus armatus*), plainfin midshipman (*Porichthys notatus*), and white croaker (*Genyonemus lineatas*) (Harvey and Torok 1994).

Although solitary in the water, harbor seals come ashore at haulouts to rest, socialize, breed, nurse, molt, and thermoregulate. Habitats used as haulout sites include tidal rocks, bayflats, sandbars, and sandy beaches (Zeiner *et al.*, 1990). Haulout sites are relatively consistent from year to year (Kopec and Harvey 1995) and females have been recorded returning to their own natal haulout to breed (Cunningham *et al.*, 2009). Although harbor seals haul out at approximately 20 locations around San Francisco Bay, there are three primary sites: Mowry Slough in the South Bay, Corte Madera Marsh and Castro Rocks in the North Bay, and Yerba Buena Island in the Central Bay (Grigg 2008; Gibble 2011). Yerba Buena Island is the closest haulout to the project, located approximately 1.5 miles from the project location. Harbor seals use Yerba Buena Island year-round, with the largest numbers seen during winter months, when Pacific herring spawn (Grigg 2008). During marine mammal monitoring for construction of the new Bay Bridge, harbor seal counts at Yerba Buena Island ranged from zero to a maximum of

188 individuals (Caltrans 2012). Higher numbers may occur during molting and breeding seasons.

Northern Elephant Seal

Northern elephant seals are common on California coastal mainland and island sites where they pup, breed, rest, and molt. The largest rookeries are on San Nicolas and San Miguel Islands in the Northern Channel Islands. In the vicinity of San Francisco, elephant seals breed, molt, and haul out at Año Nuevo Island, the Farallon Islands, and Point Reyes National Seashore (Lowry *et al.*, 2014). Both sexes make two foraging migrations each year, one after breeding and the second after molting (Stewart and DeLong 1995). Adults reside in offshore pelagic waters when not breeding or molting. Northern elephant seals haul out to give birth and breed from December through March, and pups remain onshore or in adjacent shallow water through May, when they may occasionally make brief stops in San Francisco Bay (Caltrans 2015b).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten 1999; Au and Hastings 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans).

Subsequently, NMFS (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibels (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. The functional groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): generalized hearing is estimated to occur between approximately 7 hertz (Hz) and 35 kilohertz (kHz);
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): generalized hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera Kogia and Cephalorhynchus; including two members of the genus Lagenorhynchus, on the basis of recent echolocation data and genetic data): generalized hearing is estimated to occur between approximately 275 Hz and 160 kHz;
- Pinnipeds in water; Phocidae (true seals): generalized hearing is estimated to occur between approximately 50 Hz to 86 kHz; and
- Pinnipeds in water; Otariidae (eared seals): generalized hearing is estimated to occur between 60 Hz and 39 kHz.

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2016) for a review of available information. Seven marine mammal species (three cetacean and four pinniped (two otariid and two phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 2. Of the cetacean species that may be present, one is classified as a low-frequency cetacean (gray whale), one is classified as a mid-frequency cetacean (bottlenose dolphin), and one is classified as a high-frequency cetacean (harbor porpoise).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The "Estimated Take by Incidental Harassment" section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis and Determination" section considers the content of this section, the "Estimated Take by Incidental Harassment" section, and the "Proposed Mitigation" section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in Hz or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds and attenuate (decrease) more rapidly in shallower water. Amplitude is the height of the sound pressure wave or the ‘loudness’ of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (µPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 µPa). The received level is the sound level at the listener’s position. Note that all underwater sound levels in this document are referenced to a pressure of 1 µPa and all airborne sound levels in this document are referenced to a pressure of 20 µPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Rms is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). Rms accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al*., 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g*., waves, earthquakes, ice, atmospheric sound), biological (*e.g*., sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g*., vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al*., 1995):

- *Wind and waves*: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions;

- *Precipitation*: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times;
- *Biological*: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz; and
- *Anthropogenic*: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al*., 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g*., a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

The sum of the various natural and anthropogenic sound sources at any given location and time – which comprise “ambient” or “background” sound – depends not only on the SLs (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al*., 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

The underwater acoustic environment at the ferry terminal is likely to be dominated by noise from day-to-day port and vessel activities. This is a highly industrialized area with high-use from small- to medium-sized vessels, and larger vessel that use the nearby major shipping channel. Underwater sound levels for water transit vessels, which operate throughout the day from the San Francisco Ferry Building ranged from 152 dB to 177 dB (WETA 2003a). While there are no current measurements of ambient noise levels at the ferry terminal, it is likely that levels within the basin periodically exceed the 120 dB threshold and, therefore, that the high levels of anthropogenic activity in the basin create an environment far different from quieter habitats where behavioral reactions to sounds around the 120 dB threshold have been observed (*e.g.*, Malme *et al*., 1984, 1988).

In-water construction activities associated with this project would include impact and vibratory pile driving. The sounds produced by these activities fall into one of two general sound types: pulsed and non-pulsed (defined in the following section). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.,* Ward 1997 in Southall *et al.,* 2007). Please see Southall *et al.* (2007) for an in-depth discussion of these concepts.

Pulsed sound sources (*e.g*., explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI 1986; Harris 1998; NIOSH 1998; ISO 2003; ANSI 2005) and occur either as isolated events or repeated in some succession. Pulsed sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Non-pulsed sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI 1995; NIOSH 1998). Some of these non-pulsed sounds can be transient signals of short duration but without the essential properties of pulses (*e.g.*, rapid rise time). Examples of non-pulsed sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems (such as those used by the U.S. Navy). The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak SPLs may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al*., 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al*., 2005).

Acoustic Impacts

Please refer to the information given previously (*Description of Sound Sources*) regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following; temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Gotz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to WETA's construction activities.

Richardson *et al*. (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e*., when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

We describe the more severe effects (*i.e*., permanent hearing impairment, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that WETA's activities may result in such effects (see below for further discussion). Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al*., 1999; Schlundt *et al*., 2000; Finneran *et al*., 2002, 2005b). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e*., tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al*., 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g*., Ward 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals – PTS data exists only for a single harbor seal (Kastak *et al*., 2008) – but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above a 40-dB threshold shift approximates PTS onset; *e.g*., Kryter *et al*., 1966; Miller 1974) that inducing mild TTS (a 6-dB TS approximates TTS onset; *e.g*., Southall *et al*., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as impact pile driving pulses as received close to the source) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (*e.g*., change in dive profile as a result of an avoidance reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007; Zimmer and Tyack 2007). WETA's activities do not involve the use of devices such as explosives or mid-frequency active sonar that are associated with these types of effects.

Temporary threshold shift – TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale [*Delphinapterus leucas*], harbor porpoise, and Yangtze finless porpoise [*Neophocoena asiaeorientalis*]) and three species of pinnipeds (northern elephant seal, harbor seal, and California sea lion) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (*e.g.*, Finneran *et al*., 2002; Nachtigall *et al.*, 2004; Kastak *et al.*, 2005; Lucke *et al.*, 2009; Popov *et al.*, 2011). In general, harbor seals (Kastak *et al.*, 2005; Kastelein *et al.*, 2012a) and harbor porpoises (Lucke *et al*., 2009; Kastelein *et al.*, 2012b) have a lower TTS onset than other measured pinniped or cetacean species. Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007) and Finneran and Jenkins (2012).

Behavioral effects – Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al.*, 1995; Wartzok *et al.*, 2003; Southall *et al.*, 2007; Weilgart 2007; Archer *et al.*, 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.*, 2012), and can vary depending on characteristics associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.*, 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.*, 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.*, 1995; NRC 2003; Wartzok *et al.*, 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.*, 1997; Finneran *et al.*, 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al.*, 1995; Nowacek *et al.*, 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau and Bejder 2007; Weilgart 2007; NRC 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.*, Frankel and Clark 2000; Costa *et al.*, 2003; Ng and Leung 2003; Nowacek *et al.*; 2004; Goldbogen *et al.*., 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.*, foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.*, bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al.*, 2001; Nowacek *et al.*, 2004; Madsen *et al.*, 2006; Yazvenko *et al.*, 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.*, Kastelein *et al.*, 2001, 2005b, 2006; Gailey *et al.*, 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al.*, 2000; Fristrup *et al.*, 2003; Foote *et al.*, 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.*, 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al.*, 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.*, 1995). For example, gray whales are known to change direction – deflecting from customary migratory paths – in order to avoid noise from seismic surveys (Malme *et al.*, 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.*, 1994; Goold 1996; Stone *et al.*, 2000; Morton and Symonds 2002; Gailey *et al.*, 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.*, Blackwell *et al.*, 2004; Bejder *et al.*, 2006; Teilmann *et al.*, 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.*, directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.*, when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.*, Beauchamp and Livoreil 1997; Fritz *et al.*, 2002; Purser and Radford 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.*, decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.*, Harrington and Veitch, 1992; Daan *et al.*, 1996; Bradshaw *et al.*, 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.*, 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses – An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.*, 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.*, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al.*, 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al.*, 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

Auditory masking – Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*, those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.*, 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al.*, 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al.*, 2000; Foote *et al.*, 2004; Parks *et al.*, 2007b; Di Iorio and Clark 2009; Holt *et al.*, 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g.*, Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al.*, 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Acoustic Effects, Underwater

Potential Effects of Pile Driving – The effects of sounds from pile driving might include one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al*., 1995; Gordon *et al*., 2003; Nowacek *et al*., 2007; Southall *et al*., 2007). The effects of pile driving on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g.*, sand) would absorb or attenuate the sound more readily than hard substrates (*e.g.*, rock) which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al*., 2008). Potential effects from impulsive sound sources like pile driving can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al*., 1973).

Hearing Impairment and Other Physical Effects— Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing TSs. PTS constitutes injury, but TTS does not (Southall *et al*., 2007). Based on the best scientific information available, the SPLs for the construction activities in this project are below the thresholds that could cause TTS or the onset of PTS (Table 3).

Non-auditory Physiological Effects—Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.,* 2006; Southall *et al.,* 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving or removal to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.,* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

Disturbance Reactions

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.*, 1995): changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g.*, pinnipeds flushing into water from haulouts or rookeries). Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g.*, through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g.*, Lusseau and Bejder 2007; Weilgart 2007).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Longer-term habitat abandonment due to loss of desirable acoustic environment; and
- Longer-term cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.*, 2007)

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking. The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water pile driving and removal is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. The most intense underwater sounds in the proposed action are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving activity is relatively short-term, with rapid pulses occurring for approximately fifteen minutes per pile. The probability for impact pile driving resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term, with rapid oscillations occurring for approximately one and a half hours per pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis.

Acoustic Effects, Airborne

Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled-out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been ‘taken’ as a result of exposure to underwater sound above the behavioral harassment thresholds, which are in all cases larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take.

Multiple instances of exposure to sound above NMFS' thresholds for behavioral harassment are not believed to result in increased behavioral disturbance, in either nature or intensity of disturbance reaction. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Anticipated Effects on Habitat

The proposed activities at the Ferry Terminal would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources such as forage fish and may affect acoustic habitat (see masking discussion above). There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by vibratory and impact pile driving and removal in the area. However, other potential impacts to the surrounding habitat from physical disturbance (*i.e.*, increased turbidity) are also possible.

Pile Driving Effects on Potential Prey (Fish)

Construction activities would produce continuous (*i.e*., vibratory pile driving) sounds and pulsed (*i.e*. impact driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.*, 1992; Skalski *et al.*, 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

Pile Driving Effects on Potential Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in San Francisco Bay. Avoidance by potential prey (*i.e.*, fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the San Francisco ferry terminal and nearby vicinity in San Francisco Bay.

The duration of the construction activities is relatively short. The construction window is six months long, with construction expected to take no more than 41 days. Each day, construction would only occur for a few hours during the day. Impacts to habitat and prey are expected to be minimal based on the short duration of activities.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns for individual marine mammals resulting from exposure to acoustic sources (*i.e.*, impact and vibratory pile driving). Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (*i.e.*, bubble curtain, soft start, shutdowns, etc.—discussed in detail below in Proposed Mitigation section), Level A harassment is neither anticipated nor proposed to be authorized. As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Described in the most basic way, we estimate take by considering: 1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence of marine mammals within these ensonified areas; and, 4) and the number of days of activities. Below, we describe these components in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment for non-explosive sources – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2011). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.*, seismic airguns and impact pile driving) or intermittent (*e.g.*, scientific sonar) sources.

WETA's proposed activity includes the use of continuous (vibratory pile driving) and impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 μPa (rms) are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2016) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). WETA's proposed activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at: *http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm*.

Table 3. Thresholds Identifying the Onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1μPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds.

Level B Harassment

In-Water Disturbance during Vibratory Pile Driving – Level B behavioral disturbance may occur incidental to the use of a vibratory hammer due to propagation of underwater noise during installation of new steel piles. A total of 81 steel piles will be installed at the Ferry Terminal. During the 2017 construction season, all piles were installed using a vibratory hammer. The hydroacoustic monitoring conducted for vibratory driving during the 2017 season has been used to establish the expected source values of piles driven during the 2018 construction season. The SLs were measured at 10 m for the 30- and 36-in piles and between 9 and 15 m for the 24-in piles. The SLs for 24-in piles were calculated using the measured values from 9 to 15 m normalized to 10 m. The maximum peak, maximum rms, and mean SEL values for each of the pile types (24-, 30-, and 36-in steel piles) were used as the SLs to estimate take from vibratory driving. These values are provided in Table 4.

Table 4. Sound Source Levels by Pile Type.

Pile Size and Installation Method	Source Level at 10 m (dB re 1 µPa)		
	Peak	**RMS**	**SEL**
24-in Vibratory	183	165	160
24-in Impact[1, 2]	193	180	167
30-in Vibratory	181	157	153
30-in Impact[1, 2]	200	180	167
36-in Vibratory	191	173	159
36-in Impact[1, 2]	200	183	173

[1]Caltrans 2009
[2]Impact SLs include 10 dB reduction due to bubble curtain

Additionally, monitoring conducted during 2017 construction established that for vibratory pile driving in the project area, the transmission loss is greater than the standard value of 15 used in typical take calculations. For estimating take from vibratory pile driving, Level B harassment zones are calculated using the average transmission loss measured in 2017 minus one standard deviation of those measurements (22.26 – 3.51 = 18.75). Using the calculated transmission loss model (18.75logR), the in-water Level B harassment zones were determined for each pile size (Table 5). For 24-in steel piles driven with a vibratory hammer, the Level B harassment zone is expected to be 2,512 m (8,421 ft). For 30-in piles, the Level B harassment zone is expected to be 940 m (3,084 ft). For 36-in piles, the Level B harassment zone is expected to be 6,709 m (22,011 ft).

In-Water Disturbance during Impact Pile Driving – As stated previously, all piles installed in the 2017 construction season were installed solely using a vibratory hammer. However, the use of an impact hammer to install piles may be required; therefore, the effects of impact pile driving is discussed here. Level B behavioral disturbance may occur incidental to the use of an impact hammer due to the propagation of underwater noise during the installation of steel piles. Piles will be driven to approximately 120 to 140 ft below Mean Lower Low Water (MLLW). Installation of these pipe piles may require up to 1,800 strikes per piles from an impact hammer using a DelMag D46-32, or similar diesel hammer, producing approximately 122,000 foot-pounds maximum energy per blow, and 1.5 seconds per blow average.

Other projects constructed under similar circumstances were reviewed to estimate the approximate noise produced by the 24-, 30, and 36-in steel piles. These projects include the driving of similarly sized piles at the Alameda Bay Ship and Yacht project, the Rodeo Dock Repair project, and the Amorco Wharf Repair Project (Caltrans 2012). Bubble curtains will be used during the installation of these piles, which, based on guidance provided by Caltrans for a mid-sized steel piles (with a diameter greater than 24 but less than 48 in), is expected to reduce noise levels by 10 dB rms (Caltrans 2015a).

Because no impact pile driving was used in the 2017 construction season, no site-specific transmission loss measurements exist for this project. The Practical Spreading Loss Model (15logR) is used to determine the Level B harassment zones for each pile size (Table 5). Both 24- and 30-in steel piles have a SL of 180 dB rms re 1 μPa and therefore have the same Level B harassment zone of 215 m (705 ft). For 36-in piles, the Level B harassment zone is expected to be 341 m (1,120 ft).

Table 5. Pile Driving Source Levels and Level B Harassment Zones.

Pile Size and Installation Method	Source Level (dB re 1 µPa rms)	Level B Threshold (dB re 1 µPa rms)	Propagation (xLogR)	Distance to Level B Threshold (m)	Area of Level B Harassment Zone (square km)
24-in Vibratory	165	120	18.75	2,512	7.30
24-in Impact	180[a]	160	15	215	0.08
30-in Vibratory	157	120	18.75	940	1.08
30-in Impact	180[a]	160	15	215	0.08
36-in Vibratory	173	120	18.75	6,709	33.5
36-in Impact	183[a]	160	15	341	0.18

[a]Impact source levels include 10 dB reduction due to bubble curtain

Level A Harassment

When NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which will result in some degree of overestimate of Level A take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources (such as impact and vibratory pile driving), NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet, and the resulting isopleths are reported below.

Table 6. Inputs for Determining Distances to Cumulative PTS Thresholds.

Pile Size and Installation Method	Source Level at 10 m (SEL)	Source Level at 10 m (rms)	Propagation (xLogR)	Number of Strikes Per Pile	Number of Piles Per Day	Activity Duration (seconds)
24-in Vibratory		165	18.75		4	900
24-in Impact	167[a]		15	1,800	3	
30-in Vibratory		157	18.75		4	900
30-in Impact	167[a]		15	1,800	3	
36-in Vibratory		173	18.75		4	1200
36-in Impact	173[a]		15	1,800	2	

[a] Source level includes 10 dB reduction due to bubble curtain

Table 7. Resulting Level A Isopleths.

Pile Size and Installation Method	**Distance to Level A Threshold (m)**				
	Low-Frequency Cetaceans	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**
24-in Vibratory	12	2	17	8	< 1
24-in Impact	264	9	314	141	10
30-in Vibratory	4	< 1	6	3	<1
30-in Impact	264	9	314	141	10
36-in Vibratory	38	5	52	26	3
36-in Impact	505	18	602	270	20

The resulting PTS isopleths assume an animal would remain stationary at that distance for the duration of the activity. The largest isopleths result from impact pile driving. All piles installed in the 2017 construction season were driven solely using a vibratory hammer indicating that vibratory driving will be the most likely method of installation in the 2018 season. Given the short duration within a day that impact driving may be conducted and the mitigation measures proposed by WETA, Level A take is neither expected nor proposed to be authorized.

Marine Mammal Occurrence

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

Gray Whale

Caltrans Richmond-San Rafael Bridge project monitors recorded 12 living and two dead gray whales in the surveys performed in 2012. All sightings were in either the Central or North Bay, and all but two sightings occurred during the months of April and May. One gray whale was sighted in June and one in October. The Oceanic Society has tracked gray whale sightings since they began returning to San Francisco Bay regularly in the late 1990s. Most sightings occurred just a mile or two inside of the Golden Gate, with some traveling into San Pablo Bay in the northern part of the San Francisco Bay (Self 2012). The Oceanic Society data show that all age classes of gray whales enter San Francisco Bay and they enter as singles or in groups of up to five individuals (Winning 2008). It is estimated that two to six gray whales enter San Francisco Bay in any given year.

Bottlenose Dolphin

Bottlenose dolphins are most often seen just within the Golden Gate or just east of the bridge when they are present in San Francisco Bay, and their presence may depend on the tides (GGCR 2016). Beginning in the summer of 2015, one to two bottlenose dolphins have been observed frequently swimming in the Oyster Point area of South San Francisco (GGCR 2016, 2017; Perlman 2017). Despite this recent occurrence, this stock is highly transitory in nature and is not expected to spend extended periods of time in San Francisco Bay. However, the number of sightings in the Central Bay has increased, suggesting that bottlenose dolphins are becoming more of a resident species.

Harbor Porpoise

In the last six decades, harbor porpoises have been observed outside of San Francisco Bay. The few porpoises that entered were not sighted past the Central Bay close to the Golden Gate Bridge. In recent years, however, there have been increasingly common observations of harbor porpoises in central, North, and South San Francisco Bay. According to observations by the Golden Gate Cetacean Research team as part of their multi-year assessment, over 100 porpoises may be seen at one time entering San Francisco Bay and over 600 individual animals have been documented in a photo-ID database. Porpoise activity inside San Francisco Bay is thought to be related to tide-dependent foraging, as well as mating behaviors (Keener 2011; Duffy 2015). Sightings are concentrated in the vicinity of the Golden Gate Bridge and Angel Island, with fewer numbers sighted south of Alcatraz and west of Treasure Island (Keener 2011).

California Sea Lion

In San Francisco Bay, sea lions haul out primarily on floating K docks at Pier 39 in the Fisherman's Wharf area of the San Francisco Marine. The Pier 39 haulout is approximately 1.5 miles from the project vicinity. The Marine Mammal Center (TMMC) in Sausalito, California has performed monitoring surveys at this location since 1991. A maximum of 1,706 sea lions was seen hauled out during one survey effort in 2009 (TMMC 2015). Winter numbers are generally over 500 animals (Goals Project 2000). In August to September, counts average from 350 to 850 (NMFS 2004). Of the California sea lions observed, approximately 85 percent were male. No pupping activity has been observed at this site or at other locations in the San Francisco Bay (Caltrans 2012). The California sea lions usually frequent Pier 39 in August after returning from the Channel Islands (Caltrans 2013). In addition to the Pier 39 haulout, California sea lions haul out on buoys and similar structures throughout San Francisco Bay. They are mainly seen swimming off the San Francisco and Marin shorelines within San Francisco Bay, but may occasionally enter the project area to forage.

Northern Fur Seal

Juvenile northern fur seals occasionally strand during El Niño events (TMMC 2016). In normal years, TMMC admits about five northern fur seals that strand on the central California coast. During El Niño years, this number dramatically increases. For example, during the 2006 El Niño event, 33 fur seals were admitted. Some of these stranded animals were collected from shorelines in San Francisco Bay (TMMC 2016). The shoreline in the vicinity of the project is developed waterfront, consisting of piers and wharves where northern fur seals are unlikely to strand.

Pacific Harbor Seal

Long-term monitoring studies have been conducted at the largest harbor seal colonies in Point Reyes National Seashore and Golden Gate National Recreation Area since 1976. Castro Rocks and other haulouts in San Francisco Bay are part of the regional survey area for this study and have been included in annual survey efforts. Between 2007 and 2012, the average number of adults observed ranged from 126 to 166 during the breeding season (March through May), and from 92 to 129 during the molting season (June through July) (Truchinski *et al.*, 2008; Flynn *et al.*, 2009; Codde *et al.*, 2010, 2011, 2012; Codde and Allen 2015). Marine mammal monitoring at multiple locations inside San Francisco Bay was conducted by the California Department of Transportation (Caltrans) from May 1998 to February 2002, and determined that at least 500 harbor seals populate San Francisco Bay (Green *et al.*, 2002). This estimate agrees with previous seal counts in the San Francisco Bay, which ranged from 524 to 641 seals from 1987 to 1999 (Goals Project 2000).

Yerba Buena Island is the nearest harbor seal haulout site, with as many as 188 individuals observed hauled out. Harbor seals are more likely to be hauled out in the late afternoon and evening, and are more likely to be in the water during the morning and early afternoon. Tidal stage is a major controlling factor of haulout use by harbor seals, with more seals present during low tides than high tide periods (Green *et al.*, 2002). Therefore, the number of harbor seals in the vicinity of Yerba Buena Island will vary throughout the work period.

Northern Elephant Seal

Northern elephant seals are seen frequently on the California coast. Elephant seals aggregate at various sites along the coast to give birth and breed from December through March. Pups remain onshore or in adjacent shallow water through May. Adults make two foraging migrations each year, one after breeding and the second after molting (Stewart and DeLong 1995). Most strandings occur in May as young pups make their first trip out to sea. When those pups return to their rookery sites to molt in late summer and fall, some make brief stops in San Francisco Bay. Approximately 100 juvenile elephant seals strand in San Francisco Bay each year, including individual strandings at Yerba Buena Island and Treasure Island (fewer than 10 strandings per year) (Caltrans 2015b).

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

While impact pile driving may be used during this project, all piles in the previous year of construction were installed completely with vibratory pile driving. Impact driving take calculations are included for informational purposes (Tables 8 and 9). However, only vibratory pile driving take calculations are conservatively used for the take estimation in this IHA as vibratory driving is the most likely method of pile installation and results in greater Level B harassment zones.

Gray Whale

Gray whales occasionally enter San Francisco Bay during their northward migration period of February and March. Pile driving is not proposed to occur during this time and gray whales are not likely to be present at other times of the year. It is estimated that two to six gray whales enter the Bay in any given year, but they are unlikely to be present during the work period (June 1 through November 30). However, individual gray whales have occasionally been observed in San Francisco Bay during the work period, and therefore it is estimated that, at most, one gray whale may be exposed to Level B harassment during two days of pile driving if they enter the Level B harassment zones (Table 12).

Bottlenose Dolphin

When bottlenose dolphins are present in San Francisco Bay, they are more typically found close to the Golden Gate. Recently, beginning in 2015, two individuals have been observed frequently in the vicinity of Oyster Point (GGCR 2016, 2017; Perlman 2017). The average reported group size for bottlenose dolphins is five. Reports show that a group normally comes into San Francisco Bay and transits past Yerba Buena Island once per week for approximately a two week stint, then leaves (NMFS 2017b). Assuming the dolphins come into San Francisco Bay three times per year, the group of five dolphins would make six passes through the Level B harassment zone for a total of 30 takes (Table 12).

Harbor Porpoise

A small but growing population of harbor porpoises uses San Francisco Bay. Porpoises are usually spotted in the vicinity of Angel Island and the Golden Gate Bridge (Keener 2011), but may use other areas of the Central Bay in low numbers. During construction activities in 2017, marine mammal observers recorded eight sightings of harbor porpoises, including a group of two to three individuals that was seen three times over the course of the pile-driving season. Harbor porpoises generally travel individually or in small groups of two or three (Sekiguchi 1995), and a pod of up to four individuals was observed in the area south of Yerba Buena Island during the 2017 Bay Bridge monitoring window. A pod of four harbor porpoises could potentially enter the Level B harassment zone on as many as eight days of pile driving, for 32 total takes (Table 12).

California Sea Lion

Caltrans has conducted monitoring of marine mammals in the vicinity of the Bay Bridge for 16 years. From those data, Caltrans has produced at-sea density estimates for California sea lions of 0.09 animals per square kilometer (0.23 per square mile) for the summer-late fall season (Caltrans 2016). Marine mammal monitoring observations from the 2017 construction season were used to calculate a project-specific estimate of take per driving day (1.29 animals per day). Observations from marine mammal monitoring in 2017 were assumed to represent the occurrence of California sea lions along the waterfront while the Caltrans density represents the occurrence of California sea lions in open water in the bay. The two numbers were combined to calculate the daily average take over the entire Level B harassment zone (Table 8).

Table 8. Estimated Daily California Sea Lion Takes.

Pile Size and Installation Method	Area of Level B Harassment Zone (square km)	At-Sea Density (animals per square km)[a]	Takes Per Day from Density	Takes Per Day from 2017 Monitoring	Total Daily Level B Takes
24-in Vibratory	7.304	0.23	0.66	1.29	1.95
24-in Impact	0.084	0.23	0.01	1.29	1.30
30-in Vibratory	1.083	0.23	0.10	1.29	1.39
30-in Impact	0.084	0.23	0.01	1.29	1.30

36-in Vibratory	33.497	0.23	3.02	1.29	4.31
36-in Impact	0.177	0.23	0.02	1.29	1.31

[a]Caltrans 2016

During El Niño conditions, the density of California sea lions in San Francisco Bay may be much greater than the value used above. The likelihood of El Niño conditions occurring in 2018 is currently low, with La Niña conditions expected to develop (NOAA 2018). However, to account for the potential of El Niño developing in 2018, daily take estimated has been increase by a factor of 5 for each pile type (Table 9).

Table 9. Estimated Total California Sea Lion Takes from Vibratory Pile Driving.

Pile Size	**Number of Piles**	**Number of Days**	**Daily Takes**	**Total Takes by Pile**
24-in	35	18	9.75	176
30-in	18	9	6.95	63
36-in	28	14	21.55	302
			Total	541

Northern Fur Seal

The incidence of northern fur seals in San Francisco Bay depends largely on oceanic conditions, with animals more likely to strand during El Niño events. El Niño conditions are unlikely to develop in 2018 (NOAA 2018) but it is anticipated that up to 10 northern fur seals may be in San Francisco Bay and enter the Level B harassment zone (Table 12) (NMFS 2016b).

Pacific Harbor Seal

Caltrans has produced at-sea density estimates for Pacific harbor seals of 0.83 animals per square kilometer (2.15 per square mile) for the fall-winter season (Caltrans 2016). Even though work will predominantly occur during the summer, when at-sea density has been observed to be lower (Caltrans 2016), the higher value of fall-winter density is conservatively used. Additionally, marine mammal monitoring observations from the 2017 construction season were used to calculate a project-specific estimate of take per driving day (3.18 animals per day). Observations from marine mammal monitoring in 2017 were assumed to represent the occurrence of harbor seals along the waterfront while the Caltrans density represents the occurrence of harbor seals in open water in the bay. The two numbers were combined to calculate the daily average take over the entire Level B harassment zone (Table 10). The daily take and days of pile installation were used to calculate total harbor seal Level B takes (Table 11).

Table 10. Estimated Daily Harbor Seal Takes.

Pile Size and Installation Method	Area of Level B Harassment Zone (square km)	At-Sea Density (animals per square km)[a]	Takes Per Day from Density	Takes Per Day from 2017 Monitoring	Total Daily Level B Takes
24-in Vibratory	7.304	0.83	6.06	3.18	9.24
24-in Impact	0.084	0.83	0.07	3.18	3.25
30-in Vibratory	1.083	0.83	0.90	3.18	4.08
30-in Impact	0.084	0.83	0.07	3.18	3.25
36-in Vibratory	33.497	0.83	27.8	3.18	30.98
36-in Impact	0.177	0.83	0.15	3.18	3.33

[a]Caltrans 2016

Table 11. Estimated Total Pacific Harbor Seal Takes from Vibratory Pile Driving.

Pile Size	Number of Piles	Number of Days	Daily Takes	Total Takes by Pile
24-in	35	18	9.24	166
30-in	18	9	4.08	37
36-in	28	14	30.98	434
			Total	637

Northern Elephant Seal

Small numbers of elephant seals haul out or strand on Yerba Buena Island and Treasure Island each year. Monitoring of marine mammals in the vicinity of the Bay Bridge has been ongoing for 15 years. From these data, Caltrans has produced an estimated at-sea density for elephant seals of 0.06 animals per square kilometer (0.16 per square mile) (Caltrans 2015b). Most sightings of elephant seals occur in spring or early summer, and are less likely to occur during the period of in-water work for this project. As a result, densities during pile driving would be much lower. It is possible that a lone elephant seal may enter the Level B harassment zone once per week during the 26 week pile driving window (June 1 to November 30) for a total of 26 takes (Table 12).

Table 12. Total Level B Estimated Takes.

	Gray Whale	**Bottlenose Dolphin**	**Harbor Porpoise**	**California Sea Lion**	**Northern Fur Seal**	**Pacific Harbor Seal**	**Northern Elephant Seal**
Take Estimate	2	30	32	541	10	637	26

Proposed Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned) the likelihood of effective implementation (probability implemented as planned) and;

2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Mitigation for Marine Mammals and their Habitat

General Construction Measures

A Spill Prevention Control and Countermeasure (SPCC) plan has been prepared to address the emergency cleanup of any hazardous material, and will be available onsite. The SPCC plan incorporates SPCC, hazardous waste, stormwater, and other emergency planning requirements. In addition, the project will comply with the Port’s stormwater regulations. Fueling of land and marine-based equipment will be conducted in accordance with procedures outlined in the SPCC. Well-maintained equipment will be used to perform work, and except in the case of a failure or breakdown, equipment maintenance will be performed offsite. Equipment will be inspected daily by the operator for leaks or spills. If leaks or spills are encountered, the source of the leak will be identified, leaked material will be cleaned up, and the cleaning materials will be collected and properly disposed. Fresh cement or concrete will not be allowed to enter San Francisco Bay. All construction materials, wastes, debris, sediment, rubbish, trash, fencing, etc. will be removed from the site once project construction is complete, and transported to an authorized disposal area.

Pile Driving

Pre-activity monitoring will take place from 30 minutes prior to initiation of pile driving activity and post-activity monitoring will continue through 30 minutes post-completion of pile driving activity. Pile driving may commence at the end of the 30-minute pre-activity monitoring period, provided observers have determined that the shutdown zone (described below) is clear of marine mammals, which includes delaying start of pile driving activities if a marine mammal is sighted in the zone, as described below. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.*, the entire shutdown zone and surrounding waters must be visible to the naked eye).

If a marine mammal approaches or enters the shutdown zone during activities or pre-activity monitoring, all pile driving activities at that location shall be halted or delayed, respectively. If pile driving is halted or delayed due to the presence of a marine mammal, the activity may not resume or commence until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone and 15 or 30 minutes (for pinnipeds/small cetaceans or large cetaceans, respectively) have passed without re-detection of the animal. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than thirty minutes.

For all pile driving activities, a minimum of one protected species observed (PSO) will be required, stationed at the active pile driving rig or at the best vantage point(s) practicable to monitor the shutdown zones for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator.

Monitoring of pile driving will be conducted by qualified PSOs (see below) who will have no other assigned tasks during monitoring periods. WETA will adhere to the following conditions when selecting observers:

- Independent PSOs will be used (*i.e.*, not construction personnel);
- At least one PSO must have prior experience working as a marine mammal observer during construction activities;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience; and
- WETA will submit PSO CVs for approval by NMFS.

WETA will ensure that observers have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

To prevent Level A take of any species, shutdown zones equivalent to the Level A harassment zones will be established. If the Level A harassment zone is less than 10 m, a minimum 10 m shutdown zone will be enforced. WETA will implement shutdown zones as follows:

Table 13. Pile Driving Shutdown Zones.

Pile Size and Installation Method	Shutdown Zone (m)				
	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
24-in Vibratory	12	10	17	10	10
24-in Impact	264	10	314	141	10
30-in Vibratory	10	10	10	10	10
30-in Impact	264	10	314	141	10
36-in Vibratory	38	10	52	26	10
36-in Impact	505	18	602	270	20

If a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed approaching or within the Level B harassment zones (Table 5), pile driving and removal activities must cease immediately using delay and shut-down procedures. Activities must not resume until the animal has been confirmed to have left the area or 15 or 30 minutes (pinniped/small cetacean or large cetacean, respectively) has elapsed.

Piles driven with an impact hammer will employ a “soft start” technique to give fish and marine mammals an opportunity to move out of the area before full-powered impact pile driving begins. This soft start will include an initial set of three strikes from the impact hammer at reduced energy, followed by a 30 second waiting period, then two subsequent three-strike sets. Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of impact pile driving of 30 minutes or longer.

Impact hammers will be cushioned using a 12-in thick wood cushion block. WETA will also employ a bubble curtain during impact pile driving. WETA will implement the following performance standards:

- The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column;
- The lowest bubble ring shall be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact; and
- WETA shall require that construction contractors train personnel in the proper balancing of air flow to the bubblers, and shall require that construction contractors submit an inspection/performance report for approval by WETA within 72 hours following the performance test. Corrections to the attenuation device to meet the performance standards shall occur prior to impact driving.

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth, requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Hydroacoustic Monitoring

WETA's proposed monitoring and reporting is also described in their Hydroacoustic Monitoring Plan and Marine Mammal Monitoring Plan, available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*.

Hydroacoustic monitoring will be conducted in consultation with the California Department of Fish and Wildlife (CDFW) during a minimum of ten percent of all impact pile driving activities. Hydroacoustic monitoring of vibratory pile driving was completed during the 2017 construction season and will not be conducted in 2018. Monitoring of impact pile driving will be done in accordance with the methodology outlined in the Hydroacoustic Monitoring Plan. The monitoring will be conducted to achieve the following:

- Be based on the dual metric criteria (Popper *et al*., 2006) and the accumulated SEL;
- Establish field locations that will be used to document the extent of the area experiencing 187 dB SEL accumulated;
- Verify the distance of the Marine Mammal Level A harassment/shutdown zone and Level B harassment zone thresholds;
- Describe the methods necessary to continuously assess underwater noise on a real-time basis, including details on the number, location, distance, and depth of hydrophones and associated monitoring equipment;

- Provide a means of recording the time and number of pile strikes, the peak sound energy per strike, and interval between strikes; and
- Provide provisions to provide all monitoring data to the CDFW and NMFS.

Visual Marine Mammal Observations

WETA will collect sighting data and behavioral responses to construction for marine mammal species observed in the Level B harassment zones during the period of activity. All PSOs will be trained in marine mammal identification and behaviors and are required to have no other construction-related tasks while conducting monitoring. WETA proposes to use one PSO to monitor the shutdown zones and Level B harassment zone. During previous hydroacoustic monitoring for the Bay Bridge construction and demolition, it has not been possible to detect or distinguish sound from vibratory pile driving beyond 1,000 to 2,000 m (3,280 to 6,562 ft) from the source (Rodkin 2009). Thus, the monitoring zone for the vibratory driving of 24- and 36-in piles will be set at 2,000 m (6,562 ft). The monitoring zone for the vibratory driving of 30-in piles will be set equivalent to the Level B harassment zone (940 m, 3,084 ft). The PSO will monitor the shutdown zones and monitoring zones before, during, and after pile driving. Based on our requirements, WETA will implement the following procedures for pile driving and removal:

- The PSO will be located at the best vantage point in order to properly see the entire shutdown zone and as much of the monitoring zone as possible;
- During all observation periods, the observer will use binoculars and the naked eye to search continuously for marine mammals;

- If the shutdown zones are obscured by fog or poor lighting conditions, pile driving will not be initiated until that zone is visible. Should such conditions arise while pile driving is underway, the activity would be halted; and
- The shutdown and monitoring zones will be monitored for the presence of marine mammals before, during, and after any pile driving activity.

PSOs implementing the monitoring protocol will assess its effectiveness using an adaptive approach. The monitoring biologist will use their best professional judgment throughout implementation and seek improvements to these methods when deemed appropriate. Any modifications to the protocol will be coordinated between NMFS and WETA.

In addition, the PSO will survey the Level A and Level B harassment zones (areas within approximately 2,000 ft of the pile-driving area observable from the shore) on two separate days—no earlier than seven days before the first day of construction—to establish baseline observations. Monitoring will be timed to occur during various tides (preferably low and high tides) during daylight hours from locations that are publicly accessible (*e.g.*, Pier 14 or the Ferry Plaza). The information collected from baseline monitoring will be used for comparison with results of monitoring during pile-driving activities.

Data Collection

WETA will record detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, WETA will attempt to distinguish between the number of individual animals taken and the number of incidences of take. We require that, at a minimum, the following information be collected on the sighting forms:

- Date and time that monitored activity begins or ends;

- Construction activities occurring during each observation period;
- Weather parameters (*e.g.*, percent cover, visibility);
- Water conditions (*e.g.*, sea state, tide state);
- Species, numbers, and, if possible, age and sex class of marine mammals;
- Description of any observable marine mammal behavior patterns, including bearing and direction of travel, and if possible, the correlation to SPLs;
- Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
- Description of implementation of mitigation measures (*e.g.*, shutdown or delay);
- Locations of all marine mammal observations; and
- Other human activity in the area.

Reporting

A draft report will be submitted to NMFS within 90 days of the completion of marine mammal monitoring, or sixty days prior to the requested date of issuance of any future IHA for projects at the same location, whichever comes first. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving and removal days, and will also provide descriptions of any behavioral responses to construction activities by marine mammals and a complete description of all mitigation shutdowns and the results of those actions and an extrapolated total take estimate based on the number of marine mammals observed during the course of construction. A final report must be submitted within 30 days following resolution of comments on the draft report.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Pile driving activities associated with the ferry terminal construction project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level B harassment (behavioral disturbance) only, from underwater sounds generated from pile driving and removal. Potential takes could occur if individuals of these species are present in the ensonified zone when pile driving and removal occurs.

No injury, serious injury, or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory hammers will be the primary method of installation (impact driving is included only as a contingency). Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. If impact driving is necessary, implementation of soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient "notice" through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious. WETA will also employ the use of 12-in-thick wood cushion block on impact hammers, and a bubble curtain as sound attenuation devices. Environmental conditions in San Francisco Ferry Terminal mean that marine mammal detection ability by trained observers is high, enabling a high rate of success in implementation of shutdowns to avoid injury.

WETA's activities are localized and of relatively short duration (a maximum of 41 days of pile driving over the work season). The entire project area is limited to the San Francisco ferry terminal area and its immediate surroundings. These localized and short-term noise exposures may cause short-term behavioral modifications in harbor seals, northern fur seals, northern elephant seals, California sea lions, harbor porpoises, bottlenose dolphins, and gray whales. Moreover, the planned mitigation and monitoring measures are expected to reduce the likelihood of injury and behavior exposures. Additionally, no important feeding and/or reproductive areas for marine mammals are known to be within the ensonified area during the construction time frame.

The project also is not expected to have significant adverse effects on affected marine mammals' habitat. The project activities will not modify existing marine mammal habitat for a significant amount of time. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the short duration of the activities and the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff 2006; Lerma 2014). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. Thus, even repeated Level B harassment of some small subset of the overall stock is unlikely to result in any significant realized decrease in fitness for the affected individuals, and thus will not result in any adverse impact to the stock as a whole.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized
- Injurious takes are not expected due to the presumed efficacy of the planned mitigation measures in reducing the effects of the specified activity to the level of least practicable impact;

- Level B harassment may consist of, at worst, temporary modifications in behavior (*e.g.*, temporary avoidance of habitat or changes in behavior);
- The lack of important feeding, pupping, or other areas in the action area;
- The high level of ambient noise already in the ferry terminal area; and
- The small percentage of the stock that may be affected by project activities (less than seven percent for all species).

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Section 101(a)(5)(D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Table 12 details the number of instances that animals could be exposed to received noise levels that could cause Level B harassment for the planned work at the ferry terminal project site relative to the total stock abundance. The instances of take proposed to be authorized to be taken for all stocks are considered small relative to the relevant stocks or populations even if each estimated instance of take occurred to a new individual—an unlikely scenario. The total percent of the population (if each instance was a separate individual) for which take is requested is approximately seven percent for bottlenose dolphins, two percent for harbor seals, and less than one percent for all other species (Table 14). For pinnipeds occurring in the vicinity of the ferry terminal, there will almost certainly be some overlap in individuals present day-to-day, and the number of individuals taken is expected to be notably lower. Similarly, the number of bottlenose dolphins that could be subject to Level B harassment is expected to be a single pod of five individuals exposed up to six times over the course of the project.

Table 14. Estimated Numbers and Percentage of Stocks Proposed to be Authorized.

Species	**Authorized Takes**	**Stock Abundance Estimate**	**Percentage of Total Stock (%)**
Gray whale (*Eschrichtius robustus*) *Eastern North Pacific stock*	2	20,990	0.01
Bottlenose dolphin (*Tursiops truncatus)* *California coastal stock*	30	453	6.9
Harbor Porpoise (*Phocoena phocoena*) *San Francisco-Russian River Stock*	32	9,886	0.32
California sea lion (*Zalophus californianus*) *U.S. Stock*	541	296,750	0.18
Northern fur seal (*Callorhinus ursinus*) *California stock*	10	14,050	0.07
Pacific harbor seal (*Phoca vitulina richardii*) *California stock*	637	30,968	2.06
Northern elephant seal (*Mirounga angustirostris*) *California breeding stock*	26	179,000	0.01

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has preliminarily determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to WETA for conducting their Downtown San Francisco Ferry Terminal Expansion Project, South Basin Improvements Project in San Francisco, CA, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This IHA would be valid from June 1, 2018 to May 31, 2019. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued).

The San Francisco Bay Area Water Emergency Transportation Authority (WETA) is hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(D)) to harass marine mammals incidental to conducting their Downtown San

Francisco Ferry Terminal Expansion Project, South Basin Improvements Project in San Francisco, California (CA), when adhering to the following terms and conditions.

1. This Incidental Harassment Authorization (IHA) is valid for one year from June 1, 2018 through May 31, 2018.

2. This IHA is valid only for pile driving activities associated with the Downtown San Francisco Ferry Terminal Expansion Project, South Basin Improvements Project in San Francisco Bay, CA.

3. General Conditions

(a) A copy of this IHA must be in the possession of WETA, its designees, and work crew personnel operating under the authority of this IHA.

(b) The species authorized for taking are summarized in Table 1.

(c) The taking, by Level B harassment only, is limited to the species listed in condition 3(b). See Table 1 (attached) for numbers of take authorized.

(d) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in condition 3(b) of the Authorization or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.

(e) WETA shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, acoustical monitoring team, and WETA staff prior to the start of all pile driving activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

4. Mitigation Measures

The holder of this Authorization is required to implement the following mitigation measures:

(a) For in-water heavy machinery work other than pile driving (*e.g.*, standard barges, tug boats, barge-mounted excavators, or clamshell equipment used to place or remove material), if a marine mammal comes within 10 meters, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

(b) For all pile driving, WETA shall implement shutdown zones equivalent to the Level A harassment zones. If the calculated Level A harassment zone is less than 10 m, WETA shall implement a minimum 10 m shutdown zone. Table 2 outlines the shutdown zones for each pile driving activity.

(c) If a species for which authorization has not been granted (including, but not limited to, Guadalupe fur seals and humpback whales) or if a species for which authorization has been granted but the authorized takes are met, approaches or is observed within the Level B harassment zone, activities shall shut down immediately and shall not restart until the animals have been confirmed to have left the area.

(d) WETA shall establish monitoring protocols as described below.

(i) For all pile driving activities, a Protected Species Observer (PSO) shall be employed to achieve optimal monitoring of the shutdown zones and the surrounding waters of the ferry terminal and San Francisco Bay.

(ii) This observer shall record all observations of marine mammals, regardless of distance from the pile being driven, as well as behavior and potential behavioral reactions of the animals. Observations within the ferry terminal shall be distinguished from those in the nearshore waters of San Francisco Bay.

(iii) The observer shall be equipped for commotional of marine mammal observations to relevant personnel (*e.g.*, those necessary to effect activity delay or shutdown).

(iv) Pre-activity monitoring shall take place from 30 minutes prior to initiation of pile driving activity and post-activity monitoring shall continue through 30 minutes post-completion of pile driving activity. Pile driving may commence at the end of the 30-minute pre-activity monitoring period, provided observers have determined that the shutdown zone is clear of marine mammals, which includes delaying start of pile driving activities if a marine mammal is sighted in the zone.

(v) If a marine mammal approaches or enters the shutdown zone during activities or pre-activity monitoring, all pile driving activities at that location shall be halted or delayed, respectively. If pile driving is halted or delayed due to the presence of a marine mammal, the activity may not resume or commence until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone and 15 minutes have passed without re-detection of the pinniped or small cetacean, or 30 minutes have passed without re-detection of the gray whale. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than thirty minutes.

(e) WETA shall use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of strikes at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. Soft start shall be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer.

(f) WETA shall employ a bubble curtain during impact pile driving of steel piles and shall implement the following performance standards:

(i) The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column.

(ii) The lowest bubble ring shall be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact.

5. Monitoring

The holder of this Authorization is required to conduct marine mammal monitoring during pile driving activities. Monitoring and reporting shall be conducted in accordance with the Monitoring Plan.

(a) WETA shall collect sighting data and behavioral responses to pile driving for marine mammal species observed in the monitoring zones during the period of activity. All observers shall be trained in marine mammal identification and behaviors, and shall have no other construction-related tasks while conducting monitoring.

(b) WETA shall adhere to the following conditions when selecting observers:

(i) Independent PSOs must be used (*i.e.*, not construction personnel;

(ii) At least one PSOs must have prior experience working as a marine mammal observer during construction activities;

(iii) Other PSOs may substitute education (degree in biological science or related field) or training for experience; and

(iv) WETA shall submit PSO CVs for approval by NMFS.

(c) WETA shall ensure that observers have the following additional qualifications:

(i) Ability to conduct field observations and collect data according to assigned protocols;

(ii) Experience or training in the field identification of marine mammals, including the identification of behaviors;

(iii) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;

(iv) Writing skills sufficient to prepare a report of observations including, but not limited to, the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reasons for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and

(v) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

6. Reporting

The holder of this Authorization is required to:

(a) Submit a draft report on all monitoring conducted under the IHA within ninety calendar days of the completion of marine mammal and acoustic monitoring, or sixty days prior to the issuance of any subsequent IHA for this project, whichever comes first. A final report shall be prepared and submitted within thirty days following resolution of comments on the draft report from NMFS. This report must contain the informational elements described in the Monitoring Plan, at minimum (see https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities), and shall also include:

(i) Detailed information about any implementation of shutdowns, including the distance of animals to the pile driving location and description of specific actions that ensued and resulting behavior of the animal, if any.

(ii) Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.

(iii) An estimated total take extrapolated from the number of marine mammals observed during the course of construction activities, if necessary.

(b) Reporting injured or dead marine mammals:

(i) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury, or mortality, WETA shall immediately cease the specified activities and report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS. The report must include the following information:

(1) Time and date of the incident;

(2) Description of the incident;

(3) Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);

(4) Description of all marine mammal observations and active sound source use in the 24 hours preceding the incident;

(5) Species identification or description of the animal(s) involved;

(6) Fate of the animal(s); and

(7) Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with WETA to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. WETA may not resume their activities until notified by NMFS.

(ii) In the event that WETA discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition), WETA shall immediately report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS. The report must include the same information identified in 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with WETA to determine whether additional mitigation measures or modifications to the activities are appropriate.

(iii) In the event that WETA discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), WETA shall report the incident to the Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. WETA shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS.

7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if NMFS determines the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

Table 15. Authorized Take Numbers.

Species	**Authorized Take**	
	Level A	**Level B**
Harbor seal	0	637
California sea lion	0	541
Northern elephant seal	0	26
Northern fur seal	0	10
Harbor porpoise	0	32
Gray whale	0	2
Bottlenose dolphin	0	30

Table 16. Pile Driving Shutdown Zones.

Pile Size and Installation Method	Shutdown Zone (m)				
	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
24-in Vibratory	12	10	17	10	10
24-in Impact	264	10	314	141	10
30-in Vibratory	10	10	10	10	10
30-in Impact	264	10	314	141	10
36-in Vibratory	38	10	52	26	10
36-in Impact	505	18	602	270	20

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for the proposed [action]. We also request comment on the potential for renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

On a case-by-case basis, NMFS may issue a second one-year IHA without additional notice when 1) another year of identical or nearly identical activities as described in the Specified Activities section is planned or 2) the activities would not be completed by the time the IHA expires and a second IHA would allow for completion of the activities beyond that described in the Dates and Duration section, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to expiration of the current IHA.

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted beyond the initial dates either are identical to the previously analyzed activities or include changes so minor (*e.g.*, reduction in pile

size) that the changes do not affect the previous analyses, take estimates, or mitigation and monitoring requirements; and

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

- Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures remain the same and appropriate, and the original findings remain valid.

Dated: April 24, 2018.

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Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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